Mathematical models for Hepatocytic-Erythrocytic dynamics and therapeutic control of Malaria

Titus O. Orwa, Rachel W. Mbogo, Livingstone S. Luboobi

Abstract

Malaria is one of the most frequently occurring infectious diseases worldwide (along with HIV/AIDS and tuberculosis), with almost 1 million deaths and an estimated 243 million clinical cases annually. An in-host model of malaria that describes the dynamics of the malaria parasite in the liver and blood stages and its interaction with liver cells, red blood cells and immune effectors is proposed. Conditions for existence of the diseases free equilibrium are derived. An in-host basic reproductive number is derived based on the next generation matrix method. For effective control of parasitemia, controls (antimalarials and vaccines) should target both the sporozoite and merozoite at the liver and blood stages respectively.